

Claims

- [c1] 1.A method for forming a metal silicide layer, comprising:
- providing a silicon layer;
 - introducing ions in the silicon layer to form a barrier layer in the silicon layer;
 - forming a metal layer on the silicon layer;
 - performing an annealing process so that the silicon layer reacts with the metal layer to form the metal silicide layer; and
 - removing the unreacted metal layer.
- [c2] 2.The method of claim 1, wherein the ions comprises inert ions or nitrogen ions.
- [c3] 3.The method of claim 2, wherein the inert ions includes argon ions.
- [c4] 4.The method of claim 1, wherein a material of the metal is selected from a group consisting of tungsten, molybdenum, cobalt and titanium.
- [c5] 5.The method of claim 1, wherein the step of introducing ions in the silicon layer is performed by an ion implantation process.

- [c6] 6.A method of forming semiconductor device, comprising:
forming a gate structure on a substrate, wherein the gate structure comprised a silicon layer;
forming a source/drain region beside the gate structure;
forming a spacer on the side wall on the gate structure;
introducing ions into the silicon layer and the source/drain to form a barrier layer in the silicon layer and the source/drain;
forming a metal on the substrate;
performing an annealing process so that the silicon layer and the source/drain react with the metal layer to form a metal silicide layer; and
removing the unreacted metal layer.
- [c7] 7.The method of claim 1, wherein the ions comprises inert ions or nitrogen ions.
- [c8] 8.The method of claim 7, wherein the inert ions includes argon ions.
- [c9] 9.The method of claim 8, wherein a material of the metal is selected from a group consisting of tungsten, molybdenum, cobalt and titanium.
- [c10] 10.The method of claim 7, wherein the step of introducing ions in the silicon layer is performed by an ion im-

plantation process.

- [c11] 11. A metal silicide structure, comprising:
 - a first metal silicide layer;
 - a second metal silicide layer, wherein the grain distribution of the first metal silicide layer is more uniform than that of the second metal silicide; and
 - a barrier layer between the first metal silicide layer and the second metal silicide layer, wherein the barrier layer comprises ions.
- [c12] 12. The structure of claim 11, wherein the ions comprises inert ions or nitrogen ions.
- [c13] 13. The structure of claim 12, wherein the inert ions includes argon ions.
- [c14] 14. The structure of claim 11, wherein a material of the metal is selected from a group consisting of tungsten, molybdenum, cobalt and titanium.